

# COMP 7720/8720: Artificial Intelligence

## Spring 2026

### Class Information

**Dates:** Monday, Wednesday

**Time:** 12:40-2:05pm

**Classroom:** Engr Science Bldr Room 222

### Course Description

This course will explore fundamental AI technologies, focusing on deriving intelligence from data through probabilistic reasoning and machine learning and exploring various advanced AI topics. By the end of this course, students will have the skills to apply AI techniques effectively to practical problems and critically evaluate the performance of these techniques.

### Prerequisites

- Mathematics: basics of linear algebra, multivariable calculus, probability, statistics, discrete mathematics.
- Programming skills: Python (preferred), or R/Matlab with the instructor's approval.

### Course Objectives

After this course, you should be able to

- understand the conceptual foundations of solving problems with AI and algorithms
- apply search and planning algorithms to decision-making problems
- reason under uncertainty using probabilistic models
- explain and compare symbolic, probabilistic, and learning-based AI approaches
- understand the mathematical foundations of common machine learning algorithms in AI systems
- analyze the strengths, limitations, and assumptions of AI systems
- design and analyze AI solutions for real-world problems

### Textbooks

There is no specific textbook since all materials will be provided electronically. A list of recommended readings is provided below, most of which are available online. Referenced chapters will be mentioned in the lecture slides.

Recommended reading:

- Artificial Intelligence: A Modern Approach, Stuart J. Russell and Peter Norvig, Pearson, 2009
- Pattern Recognition and Machine Learning, Chris Bishop, Springer-Verlag, 2006
- Elements of Statistical Learning, Trevor Hastie, Robert Tibshirani and Jerome Friedman, Springer, 2009
- Machine Learning: A Probabilistic Perspective, Kevin Murphy, MIT Press
- Aurelien Geron, Hands-On Machine Learning with Scikit-Learn, Keras, and TensorFlow: Concepts, Tools, and Techniques to Build Intelligent Systems

## Hardware and Software Requirements

The minimum requirements can be found at

<https://www.memphis.edu/uofmglobal/students/requirements.php>

We will talk about software environments when the first assignment is published.

## Course Topics

### 1. Introduction and Fundamental Concepts

- What is intelligence
- History and paradigms of AI
- AI vs ML: scope and distinctions

### 2. Problem Solving and Search

- State-space representation
- Uninformed search
- Informed search
- Heuristics and admissibility

### 3. Reasoning Under Uncertainty

- Deterministic vs Stochastic environments
- Probability and Bayesian reasoning
- Graphical models
- Decision making

### 4. Learning as Function Approximation

- Regression problems: linear regression, learning with uncertainty
- Classification problems: decision theory, loss functions
- Learning via optimization: gradient descent, Newton's method, boosting, perceptrons and neural networks
- Introduction to deep neural networks

## 5. Reinforcement Learning

- Agent-environment interaction
- Value-based and policy-based methods
- Multi-agent systems

## 6. Modern AI Systems and AI in Practice

- Human-in-the-loop AI
- Robustness and bias in AI
- Explainable and interpretable AI

### Assessment and Grading

Periodic quizzes and coding assignments will be administered through Canvas and the student can complete online. The specific format for mid-term and end-term exams will be provided later.

Components that determine the final grade:

- Quizzes: 15%
- Assignments: 15%
- Mid-term Exam: 25%
- End-term Exam: 30%
- Project: 15%
- Bonus (participation): up to 5%

A modified curve may be used for final grades at the instructor's discretion.

### Course Ground Rules

#### Class Attendance and Participation:

Course participation is required. There is a strong correlation between regular attendance and obtaining a good grade. The instructor reserves the right to lower grades for lack of attendance. Students are responsible for any material and contents of missed lectures.

#### Assignments and Deliverables:

No late assignments will be accepted unless well-documented reasons are presented. All assignments must be individual work. **The use of generative AI tools in writing your reports or codes is not allowed.** However, you may use generative AI to assist you with *learning*, but beware that generative AI tools make errors and it is your responsibility to ensure the correctness of your work. You may be asked to explain the code or re-create aspects of the projects – you must show that you have mastered the fundamentals.

## **Communication**

Students must use the assigned university email address rather than a personal email address. Emails should always include a subject line. Do not send large attachments without permission. Special formatting such as centering, audio messages, html, etc. should be avoided unless necessary to complete an assignment or other communication. Respect the privacy of other class members.

Be cooperative with group members in completing assigned tasks. Be positive and constructive in group discussions. Be organized and respectful when presenting group efforts.

## **Academic Integrity**

Plagiarism, cheating, and other forms of academic dishonesty are prohibited. Students guilty of academic misconduct, either directly or indirectly, through participation or assistance, are immediately responsible to the instructor of the class in addition to other possible disciplinary sanctions which may be imposed through the regular institutional disciplinary procedures.

<https://libguides.memphis.edu/academicintegrity/students>

## **Students with Disabilities**

Qualified students with disabilities will be provided reasonable and necessary academic accommodations if determined eligible by the appropriate disability services staff at their home institution. Prior to granting disability accommodations in this course, the instructor must receive written verification of a student's eligibility for specific accommodations from the disability services staff at the home institution. It is the student's responsibility to initiate contact with their home institution's disability services staff and to follow the established procedures for having the accommodation notice sent to the instructor.

## **Syllabus Changes**

The instructor reserves the right to make changes as necessary to this syllabus. If changes are necessitated during the term of the course, the instructor will immediately notify students of such changes both by individual email communication and posting both notification and nature of change(s) on the course bulletin board.